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## ABSTRACT

This report describes and analyzes the failure of an attempt to launch a series of off-campus graduate credit courses in transportation to update the skills of mid-career professionals. Based on an evaluative review of other programs and teaching methods, the following format was developed: (1) on-campus orientation and examination; (2) self-paced study modules with scheduled completion dates; and (3) scheduled telephone conferences with instructors. A questionnaire was developed to determine the continuing education needs of employees of several state transportation departments. Analysis of replies revealed several reasons for failure of the program: (1) preference for short intensive courses; (2) availability of on-campus evening courses; (3) preference by employees in remote areas for specifically job oriented materials; and (4) more interest in undergraduate than graduate offerings. Current lay-offs in the transportation work force was considered the main deterrent.  
(Author)

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DEVELOPMENT OF AN INSTRUCTIONAL PROGRAM  
AND MATERIALS FOR A NON-RESIDENT GRADUATE PROGRAM  
IN TRANSPORTATION

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FINAL REPORT

from

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## DEVELOPMENT OF INSTRUCTIONAL PROGRAM AND MATERIALS FOR A NON-RESIDENT GRADUATE PROGRAM IN TRANSPORTATION

### INTRODUCTION

In June, 1974, Carnegie-Mellon University was awarded a grant to explore the feasibility of providing a non-resident graduate program in transportation that would be specifically directed toward practicing professionals with a need for updating their professional skills in transportation related areas but, because of job or other requirements, could not enroll in full-time graduate study. The grant provided funds for developing the program and instructional materials.

The need for the program was earlier identified as a result of the experience gained by the Transportation Research Institute in providing a highly successful 6-week professional program in urban transportation. That program, funded by the Urban Mass Transportation Administration (UMTA) of the U. S. Department of Transportation, provides four weeks of intense on-campus class instruction, followed by a two-week study tour of European transit facilities. The course, now offered eight times, is aimed at practicing professionals in public transportation agencies. Full tuition and three-fourths of their expenses and salaries are reimbursed to their employing agencies by UMTA.

The success of that program, and the clearly identified need on the part of mid-career professionals to upgrade their skills in transportation, led to the belief that an off-campus series of courses, with academic credit, would be of considerable value to past participants in the 6-week program and others. A survey of past participants supported this view and it formed the basis for a program that would have the following objectives:

1. Individual off-campus, non-resident courses would be of similar academic quality to regular CMU on-campus courses and, if successfully completed, would carry full academic credit in the appropriate number of units.
2. The participants would visit the CMU campus for a concentrated two or three day introduction to each course but do the majority of the required work at home over a several month period. Course modules would be made available for self-paced study with work assignments scheduled for completion at established intervals. At the completion of the self-study portion, participants would return to campus for a "wrap-up"

session and a final examination.

3. During the self-study portion of each course, students would telephone questions to the instructor at scheduled hours.
4. Tuition for each course would be the same as the cost of an equivalent on-campus course at CMU (approximately \$320.00 at 1977 tuition rates) plus a surcharge for telephone expenses and printed materials.

Contrary to expectations developed on the basis of the earlier questionnaire sent to past participants of the 6-week program, the initial offering of a course in statistics was extremely disappointing. Course announcements had been sent to a select group of engineers and planners in the Western Pennsylvania region. (Appendix A is a copy of the first announcement).

As a result of the initial disappointing result, contact was made with the personnel training officials of the Pennsylvania Department of Transportation (PennDOT). They expressed strong support for the program and indicated that, upon successful completion of a course, PennDOT employees would be eligible for a tuition rebate. With PennDOT assistance, a mailing was made to each district office in Pennsylvania listing the availability of the statistics course and a forthcoming course in Transportation Investment, Pricing, Financing and Planning. Again, the response was disappointing.

Subsequently, we met with the personnel training offices of several surrounding states. In addition to discussing their views of the needs of junior and mid-career professionals, they cooperated by providing a free mailing of a questionnaire to over one thousand engineers. An analysis of the answers to the questionnaires is presented in subsequent sections. It should be noted at this point, however, that one of the significant items learned at the meeting with the personnel offices related to one significant reason for the disappointing results of our earlier offerings. Since we first formulated our proposed program for a graduate non-resident program targeted on transportation issues, there occurred a massive layoff of transportation professionals in all of the states with which we hoped to start programs. This layoff was a result of shrinking revenues of state transportation departments and a drastic cut back in new highway construction. This circumstance was a direct aftermath of the Arab oil embargo and subsequent rise in petroleum prices. In these circumstances, priorities change and professional development does not occupy the same position of importance that it does in an era of expanding opportunities.

This report outlines the results of our attempt to launch a series of non-resident graduate credit courses in transportation and describes certain guidelines that will be of benefit to others preparing such courses or programs.

## PRELIMINARY DEVELOPMENT OF COURSE FORMAT

The concept for a non-resident program in transportation grew out of the premise that there is an unmet need and demand for graduate level instruction in transportation. Among professionals employed in the transportation field, many individuals have inadequate academic training in modern transportation engineering or planning and are unable, for a myriad of reasons, to obtain such training through conventional educational programs.

It should be noted that, although the concept of off-campus instruction for credit is not new, relatively few courses of this type are provided in technical areas and few if any in transportation through accredited engineering schools.

Our original perception of the basic program was as follows:

1. The program would be non-resident in nature, not requiring continuous on-campus presence, and designed to meet the specific needs of practicing professionals.
2. The quality of the program in terms of number, breadth and depth of the courses would be comparable to traditional programs at the university.
3. All courses would be fully accredited by the university.
4. A high degree of personal involvement between instructor and student was deemed important and the following techniques were considered:
  - a. The presentation of the courses would include intensive use of film and/or video-tape techniques (hopefully to "bring the professor to the students").
  - b. Each student would be required to visit the campus at the beginning and end of each course.
5. The program may or may not be degree terminal. In any event, a few courses (for credit) would be first developed and tested.

With the above framework in mind, work commenced to develop appropriate teaching methods, review the efforts of others and establish the initial courses to be offered. In specific terms this work was aimed at refining point 1 and exploring the ramifications of point 5.

Discussions were initiated with a variety of individuals active in other non-resident programs and others concerning use of audio-visual techniques, curriculum development, and program packaging. In addition, a literature

search was undertaken, as well as a compilation of material from audio-visual equipment manufacturers and others. Appendix B summarizes contacts made, persons interviewed, and references found useful.

### Audio-Visual

The initial assumption was that there would be heavy use of film and/or video-tape. Thus contact was made with commercial and educational television producers, independent film-makers, libraries concerned with audio-visual materials and the University's own film and TV personnel as well as several teachers having experience with audio-visual aids. In general, these contacts tended to dissuade us from the use of film and/or video-tape both from the standpoint of the efficacy of teaching and that of economics. Specifically:

1. The use of film and video-tape seems better suited to presentations to small groups as opposed to individuals (the latter was our most likely format).
2. The costs for production and reproduction of extensive "visual" materials would be quite high. In addition, the administrative problems connected with monitoring the whereabouts of the films, etc., require a substantial commitment of personnel resources.
3. Although the quality of production is hard to quantify, the level must be quite high to be acceptable to the viewer. It is easy to generate simple filming of someone giving a lecture, but outside of the live classroom context, such films are boring and ineffective. Thus, a "good" film (or video tape) requires the services of a professional director/producer and the cost soars.
4. The use of extensive visual or audio reproductions for subsequent transmission to individual students is, in some sense, an attempt to over-compensate for the often perceived second-class stature of continuing education, a feeling of "guilt" associated with providing education that does not put the student in direct, frequent and personal contact with the instructor. The use of extensive audio/visual surrogates is an attempt to compensate for this perceived "deprivation".
5. When off-campus instruction is in the form of a direct extension of the on-campus class, which is the case when a group of employees are given time off to congregate in a special audio-visual room and "attend" a lecture that is actually in progress on a nearby campus, the

audio-visual material is quite appropriate - particularly since the knowledge that it is "live" adds interest. Besides, it is possible for the off-campus viewer to question the instructor via appropriate hook-ups.

Such audio-visual arrangements are usually by cable hook-up and, rather than being viewed as off-campus instruction of the sort considered in this project, they are in reality merely classroom extensions.

A review of the advantages and disadvantages of audio-visual aids to off-campus education caused us to conclude that such aids were not necessary or advisable. The maturity of the relatively older student to which this program was aimed, and the campus exposure that would be mandated at least twice for each course, would compensate for the lack of personal classroom stimulation. The effort to simulate the experience with video-tape reproduction of classroom activities could actually be counter-productive.

#### Teaching Methods

The review of various teaching methods and the experience of others involved in non-resident programs are, in some areas, inseparable. Thus, the following represents a combination of information from both activities which were initially undertaken separately.

Perhaps the most interesting recent approach to teaching is that defined as the Keller Plan, or the personalized system of instruction (which can be considered synonymous). While the "system" is not directly applicable to non-resident programs, several of the points are related to the proposed instructional format. The most significant aspect of the Keller Plan is the idea of the unitized development of a course - the development of discrete sections within the overall course which are introduced sequentially. While the idea is not necessarily new, formalization of the concept is. The unitization concept calls for thorough understanding (Keller is more explicit and uses "mastery") of each unit prior to advancement to the next unit. Understanding is demonstrated by performance on a quiz. The student thus has a succinct set of intermediate goals prior to achieving the overall goal of completion of the course. The relevance of providing intermediate goals is best illustrated in the context of one of the principal problems of non-resident programs - that of the student losing interest and dropping out of the course. It was hoped that

the provision of intermediate goals would help sustain interest and keep the student going. Other methods of sustaining enthusiasm and insuring effective information transfer include the following:

1. Structuring the on-campus seminar sessions at the beginning and end of the course so that time is set aside for individual discussions with students.
2. The possibility of regular "office" hours via the telephone (using a toll free 800 area code) to encourage students' questions to the instructors.
3. The exchange of audio-taped comments and questions.
4. Remote computer hook-ups for using the university's facilities from the student's home or office - this element being of particular interest for the course in statistics and probability.

#### Review of Programs Offered at Other Institutions

Following are observations from a review of programs for off-campus or extension education offered by other institutions.

##### General Information Concerning Non-Resident Programs

Although education by correspondence dates back beyond the turn of the century, the "traditional" correspondence course is probably visualized by the average person as being an International Correspondence School (ICS) course in radio repair or the "Famous Artists" program. These courses, while some are quite advanced and worthwhile, are mass produced and quite common. They primarily consist of a highly unitized system of presentation with specific assignments being sent in by mail, graded (often with personal comments) and sent back to the student. Generally they are self-paced to a degree (no rigid time schedule) and are conceived of by the public as being second rate.

A survey of opinions regarding correspondence education revealed a generally low opinion of such programs.\* This low opinion is further illustrated by the fact that most persons in the medical and nursing professions do not know that some courses in their field are offered through

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\* MacKenzie and Christensen, Correspondence Education in the United States, McGraw-Hill, 1968.

correspondence and that the American Bar Association flatly refuses to consider any correspondence credits as counting towards a law degree. Engineers, however, can count credit from correspondence schools towards their educational requirement for an E.I.T.

In recent years there appears to have been a resurgence of interest in the basic idea of correspondence education. From among the many institutions now operating in the field, we have specific information on Syracuse, the University of Pittsburgh and the University of Oklahoma, where non-resident (our term) programs are called independent study, external studies and advanced studies, respectively. These programs have many things in common with the program attempted at C-MU: in general all courses are fully accredited by the University, campus visits are required and courses are a semester long but self-paced within that constraint. Most of the programs are (or have the option to be) degree terminal, with Oklahoma offering the master's degree in several areas. No "technical" degrees seem to be offered in any of the programs although there is no apparent reason.

In terms of the actual on-campus requirements, all three of the schools named above have on-campus "residency" requirements. The University of Pittsburgh uses regional centers for testing purposes and some courses at Oklahoma operate entirely out of regional centers (although there is a requirement at Oklahoma that some of the courses be taken out of the main campus at Norman).

All of the programs are fairly traditional in terms of contact with the student - most use mail correspondence for the bulk of the contact beyond the class meetings scheduled at the universities or regional centers. Syracuse has made an attempt to incorporate audio tapes into the program but resistance was met with the faculty. The University of Pittsburgh has a telephone capability with a 24 hour answering service expressly for the external students although it is apparently not well used. Neither Syracuse nor Oklahoma apparently have any special telephone facilities for their students. In terms of enrollment, the University of Pittsburgh serves primarily only the southwestern part of Pennsylvania while Syracuse and Oklahoma are totally open.

Colorado also has an external program of sorts using methods involving

instructors going to non-campus locations to teach small groups (or alternatively using video tapes as a remote device).

#### Formats for Instructional Materials and Problems in Instruction

In general most of the college level courses taught by the various universities seem to have been developed along self-paced lines with information being conveyed in unitized fashion.

The meager reference material found concerning correspondence education all confirmed one important point; achievement and learning levels for correspondence students were essentially the same as those of their counterparts in conventional classroom situations.

Conveyance of information (in terms of instruction) must be recognized as being different in the correspondence situation as opposed to the conventional classroom. Dr. G. B. Childs identified several problems and hazards in correspondence situations which are worth repeating\*:

1. Problems in learning by correspondence
  - a. Developing interest and motivation
  - b. Sensing readiness (on the instructor's part to allow the student to advance)
  - c. Learning both analytic and intuitive thinking
  - d. Learning structure of subject matter
  - e. Evaluating progress
2. Hazards (where the roots of the problems lie)
  - a. Inadequate or delayed communication
  - b. Inadequate experience involving all senses
  - c. Imperfect conceptualization
  - d. Weak motivational devices
  - e. Rigidity of process
  - f. Overdependence on writing
  - g. Lack of experience with materials
  - h. Absence of interest builders
  - i. Lack of appeal to the senses

Not all of the above items are pertinent to the program discussed in this report nor are they unique to correspondence programs.

The two most crucial points identified in the literature which must be dealt with are identity and communication with the instructor and clarity in the instructional materials.

Other methods which deal with instructional problems (although they

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\* Childs, G. B., "Problems in Learning by Correspondence, "The Changing World of Correspondence Study, Christensen and MacKenzie, PSU Press, 1971.

have not been applied to non-resident programs) include the proctorial method, personalized system, etc., all of which are really outgrowths of the "Keller Plan". In short, Keller proposed a system of self-paced instruction which is based on the following five procedures:

1. The course is self-paced, allowing the student to go at his or her own speed (consistent with requirements below).
2. The course is split into sequential units with mastery of each required before advancement to the next unit.
3. Lectures and demonstrations are used as vehicles of motivation and are not required (or necessary to pass the course).
4. Related stress upon the written word in teacher-student communication.
5. The use of proctors, permitting repeated testing (for mastery of units), immediate scoring, individualized tutoring and a very personalized approach.

In the University of Pittsburgh's External Study Program, they have made a strong use of curriculum and instructional development concepts. In general, curriculum development is concerned with giving a strong structure to the courses - setting forth explicit goals for each course, definite measures for "success" and definition to the means of attainment of the goals. In a typical situation the curriculum specialist would sit down with the instructor of a course and assist him or her in defining and clarifying the goals of the course (the curriculum specialist does not deal with the substantive matters, only procedural ones).

#### Conclusions Regarding Course Format

Our review of programs offered in the past by other institutions, and a careful survey of the effectiveness of teaching aids, led to the following basic format:

1. All students would be required to visit the campus for a briefing of the course objectives and to receive the equivalent of the first four or five lectures of a conventional on-campus course.
2. Students would return home with course modules to be completed at select intervals. Before leaving, they would be assigned specific times when they could call the instructor with questions. These are essentially telephone "office hours".

3. Projects, or assignments, would be mailed in at intervals to pace the progress of the work.
4. At the end of the course period, the students would return to campus for a final day of discussion and a final examination.
5. In the event that questions called in suggest that some clarification of material is required, a special set of notes with, if desired, a tape cassette, would be mailed to each student.

It should be noted that these are several rigid guidelines in the above format. The elements that distinguish it from the familiar correspondence course are the requirement to visit the campus at the start of the course, the ability to communicate directly with the instructor and the requirement that a final examination be given on campus. The two underlying reasons for these particular requirements are (1) the courses are given full university credit and (2) every attempt is made to avoid the "stigma" of the traditional correspondence courses.

In the event that credit is not a necessary goal, and the campus visits are abandoned as an expediency to reduce (travel) costs, the courses unfortunately do degenerate to a fairly conventional correspondence extension course.

## EXPERIENCE WITH FIRST OFFERINGS

As indicated in the Introduction, a course in statistical methods was developed. Professor George Duncan of Carnegie-Mellon University developed a series of course modules for a basic statistical methods course with an emphasis on transportation related problems. A course in transportation investment, pricing, financing and planning was also outlined and announced as a future offering. Appendix C provides the syllabus for the statistics course which was fully developed and ready for presentation.

As an added incentive, arrangements were tentatively made to provide participants, on a loan basis, a programable hand calculator with a statistical package.

The course was first announced on a selective basis. Specifically, through the use of mailing lists, announcements were sent to 1100 members of the Pittsburgh section of the American Society of Civil Engineers, 900 members of the Pennsylvania Society of Professional Engineers, 250 members of the Pittsburgh Section of the American Institute of Planners and 250 past participants of Carnegie-Mellon University's 6-week professional program in urban transportation (the latter group being the same persons originally queried about their interest in such a program and who responded overwhelmingly in favor of such a concept).

Only a handful of inquiries were received and one respondent indicated a positive intention to enroll. As a result of this disappointing response, the course offering for the Fall of 1975 was cancelled.

In reviewing the disappointing response, we concluded that the tuition of \$475 was considered by many to be too high and the program would be better received by professionals who are eligible for educational expense reimbursement from their employers. For this purpose, we contacted the personnel training officer of the Pennsylvania Department of Transportation (PennDOT). After reviewing the program, he indicated that PennDOT employees would be eligible for tuition rebates and he expressed considerable support for the program. With his assistance, announcements were brought to the attention of all PennDOT professional employees through the regional offices. Again, the response was extremely disappointing. Not one PennDOT employee expressed positive interest in enrolling.

It is of interest to note that, in an effort to discover the reason for the unexpected lack of interest in the program, a visit was made to the personnel

in charge of The Advanced Study Program at the Massachusetts Institute of Technology. Although they have a successful program that brings company employees on campus for specialized instruction, they had experimented with a version of an off-campus course similar in some respects (except the credit granting characteristic) with the proposed C-MU program. They reported a similar trend. When a survey is made to gain an estimate of interest, the results are positive. But when the courses are actually offered, the response is disappointing.

In a further effort to gain an understanding of the reluctance of transportation professionals to enroll in a continuing education program with the particular characteristics of the proposed C-MU non-resident graduate program, a meeting was convened with personnel training officers or representatives from Pennsylvania and the adjacent states of Maryland, New York, Ohio, Virginia and West Virginia. The participants are listed below:

1. Gerald R. Cichy  
Assistant Director, Division of Systems Planning and Development  
Maryland Department of Transportation
2. William G. LaFleur  
Director, Staff Development and Training  
New York Department of Transportation
3. Charles Williams  
Ohio Department of Transportation
4. Robert F. Todd  
Training Supervisor  
Virginia Department of Transportation
5. Charles Ryan  
Chief of Safety and Development  
Pennsylvania Department of Transportation
6. Perry P. Dotson  
Highway Personnel Officer  
West Virginia Department of Highways
7. Peggy Peach  
Ohio Department of Transportation

The one day meeting with these representatives shed considerable light on the basic reasons for the lack of response to our offering. The key elements are summarized below.

1. The largest single need is undergraduate degree options for what are referred to as "dead-enders". These are technician grade personnel who

cannot advance into the professional grades without a traditional undergraduate degree (i.e., civil engineering, electrical engineering, etc.).

2. The more motivated personnel, who would be generally interested in graduate type courses, are usually in headquarters in a principal city and have access to traditional on-campus courses offered in the evening.
3. With respect to off-campus graduate courses offered for credit, the logical end result - a graduate degree - has relatively little value in all of the department queried because a master's degree is considered to be the equivalent of one year's experience in promotion. Thus, the practical long term advantage is not very high.
4. The particular uniqueness of the proposed C-MU program is not readily apparent. It is too easily confused with other forms of continuing education and the competition is thus quite high.
5. For the great majority of field employees (and thus those who would be the natural target for the non-resident native of our proposed program), the perceived need is for work related courses such as basic management or maintenance. Credit is relatively unimportant.
6. The most serious issue brought out, however, as mentioned in the Introduction, was the drastic cut back in employment. This circumstance did not lend itself to an atmosphere of upward mobility in the long range and, if anything, emphasized the need for short, job related courses.

At the end of the meeting, all of the state representatives agreed to use internal mailing facilities to distribute a questionnaire to determine the actual need of state transportation employees for continued professional education. A total of 3000 were thus distributed. The results are discussed in the next section.

During the discussion with the state representatives, an interesting suggestion was made. All of the representatives were familiar with the 6-week professional program in urban transportation that is provided each year by the Transportation Research Institute. Participants gain an introduction to statistics, economics and other topics pertinent to transportation.

It was suggested that we investigate the possibility of providing an optional study program, after the completion of the 6-week program, that would enable participants to gain credit in one of the subject areas.

## RESULTS OF QUESTIONNAIRE

With the assistance of the representative of the several state transportation departments previously mentioned, the questionnaire shown in Appendix D was distributed free of charge by the individual state to employees in the respective departments. The responses were collected by the individual agencies and returned to us. More than 1000 responses were obtained.

The results of the survey are summarized in parentheses in the sample questionnaire in Appendix D. A review of the responses, in abbreviated form, is presented below:

1. Questions 1, 2 and 3, which provide responses to the general concept of continuing education, yielded positive reactions. For example, Question 3, which asked if the respondent was interested in continuing education in any form, received overwhelming positive response (940 to 120).
2. When the breakdown of the types of continuing education becomes more specific, as in the later portions of Question 3, some distinctions become apparent. Workshops or seminars are the most popular with standard university courses for credit or as part of a degree program next in popularity. The least popular (as would be expected) is a standard college course with no credit. However, home study courses fared little better, although some preference for credit home study courses was exhibited.
3. In answer to Question 4b (should a course of the type discussed in this report be degree terminal), about two-thirds of the respondents were not interested in the degree terminal aspect.
4. Question 7 listed potential courses in ascending order of abstraction. That is, the first six were basic engineering type courses and the remaining eight were planning, management or policy oriented courses. The responses for the first six were more positive than negative, whereas the last nine had predominately more no's than yes's (with the exception of Management Techniques, which was about evenly divided).

A general trend perceived in the analysis of the questions to this point suggests that (1) the concept of continuing education is generally viewed as desirable, (2) in actuality it is perceived as either conventional university courses for credit or short courses and seminars and (3) the subject matter is

preferably typical of "bread and butter" routine engineering courses rather than the policy and planning type of courses. It should be noted that the thrust of the non-resident program discussed in this report was indeed toward the latter type of courses.

When a frequency distribution of responses to several of the questions is constructed, it is observed that the distributions are somewhat bi-polar (a phenomenon that is not revealed by measures such as mean or standard deviation). This suggests that there are generally two types of respondents in the sampling group. In an effort to identify these groups, an analysis was made of those persons who responded positively to Question 4a (i.e., who reached favorably to the non-resident credit program described in the report) in contrast to those who responded negatively. The analysis revealed that:

1. About 75 percent of this group (positive response to Question 4a) had a high interest in programs that were for credit or part of a degree program. This interest dropped to 50 percent when credit was deleted.
2. Of those responding positively to Question 4a, 76 percent were within 50 miles of a campus program offering appropriate courses.
3. This group tended to have more recent degrees, were younger and better educated than those responding negatively to Question 4a.
4. When the list of possible courses was ranked in order of preference by the group responding positively to Question 4a, the preferences previously noted by all respondents changed considerably in that planning and policy courses ranked higher.

The results of the survey corroborated personal observations made by the various state representatives in that those transportation employees in remote areas tend to not be degree or credit oriented but, rather, look for basic courses that are job oriented. The more academically inclined, however, are generally employed at the urban centers where most state agencies headquarters are located and they have access to conventional academic resources.

## CONCLUSIONS REGARDING EFFECTIVENESS OF PROPOSED PROGRAM

The results of our effort to launch a series of non-resident, graduate credit courses in transportation, and our discussions with a number of personnel supervisors and others, have led to the following conclusions:

1. Although the results of the survey revealed a broad spectrum of interests, there was a bi-polar response which appears to separate the highly motivated, younger group from the field personnel whose principal interest is in job oriented training. However, the motivated group is usually located in a central city with adequate opportunities for continuing education.
2. Although payment of tuition by employers is usually offered, more than that is needed to stimulate employees to pursue credit graduate work. It is clear that successful completion of such a program should lead to job advancement or other forms of recognition. The fact that a master's degree counts as one year's experience in most state transportation departments is a deterrent to putting forth the effort. On the other hand, the attainment of an undergraduate degree is essential for advancement into the professional grades.
3. With the absence of the necessity to provide credit, the options for providing continuing education are much broader (and the painfulness of taking courses much less). Thus, the more common one- or two-week summer course is effective but is quite outside the scope envisioned in this proposed non-resident program. (Carnegie-Mellon University, like other schools, offers a variety of such continuing education courses and no difficulty is foreseen in meeting future needs).
4. In spite of the negative results, and the conclusions discussed above, the unique characteristics of the proposed C-MU non-resident course offerings do have appeal. There are areas in which continuing graduate education could have measurable effects on one's job advancement and courses of the type envisaged would be attractive. However, the extensive marketing effort required to recruit students (particularly in emphasizing the uniqueness of the program in comparison to conventional continuing education short courses) places a burden on the university and raises the question of the effectiveness of utilizing resources in this manner.

5. The results of the survey suggest a strong desire on the part of many transportation professionals to continue their education in some form or another. However, the needs are widely diverse and the available options (i.e., night school, summer courses, short courses, extension programs, etc.) can satisfy most of the demand. The particular case of persons who want formal advanced courses for credit, but do not have access to a facility of higher education, do not constitute a sufficiently large group to warrant the effort and use of resources to continue a program of the type discussed in this report.

## GUIDELINES FOR CONTINUING EDUCATION PROGRAMS

The experience gained from attempting to launch a continuing education program with certain unique characteristics has provided what we believe to be some valuable guidelines that will be of use to others developing traditional continuing education programs or attempting to innovate.

With respect to the motivation to take continuing education courses, merely having access to a program of reimbursement (which was the case for almost all of those answering our questionnaire) is not enough. There must be a strong link between individual effort and commitment and recognition on the part of one's employer.

It is and probably always will be true that some will pursue continuing education for reasons of personal satisfaction. (Note that of those responding to our questionnaire, thirteen per cent were currently engaged in a form of continuing education). Except for those who are in remote areas, the current mix of continuing education programs will fill many of the perceived needs.

For the particular group of engineers surveyed as part of this project, i.e., those employed by state departments of transportation, the advanced analysis type of course, that would be characteristic of a graduate transportation curriculum, is not viewed as important as "bread and butter" job related courses. Certainly there is a need for a practitioner to constantly upgrade his design or implementation skills relative to the job for which he is currently responsible. However, the value of fundamental educational growth will not materialize as a "demand" until the employer establishes incentives.

Although Professor George Duncan, who prepared the course modules for the first offering in statistical methods, was enthusiastic in his efforts, it is of importance to note that the recruiting of faculty to participate in this planned program was difficult. It must be accepted that the great majority of faculty view continuing education as a sort of second-rate activity that detracts them from their perceived role as educators-researchers.

It is of considerable interest to note that this attitude does not apply to all continuing education activities. For example, many faculty who expressed less than enthusiasm about participation in this program frequently sponsor one-week, on-campus short courses in their particular specialty. Aside from the fact that such courses are often given in the summer for extra compensation, they view such activities within the same context as seminars, symposia or conferences. That is,

they are, in a sense, self serving in that they provide exposure for the faculty member's own efforts. But when the activity is characterized by contact with a diverse group of students off-campus, where the benefit is primarily for the student, the visibility offered the faculty member is minimal. Thus, unless the school provides substantial recognition for such efforts (and such is frequently not the case), there is little incentive to participate. (The situation is quite parallel to that discussed above from the participant's viewpoint: if the employer does not provide incentives, the practicing engineer will not pursue education that is not specifically job-related).

In viewing the proposed C-MU non-resident program in the general context of continuing education, it should be emphasized that this program attempted to provide courses off-campus that were in almost all respects of the same quality (and for credit) as graduate courses given to regular, full-time students. In contrast, many continuing education programs (with the obvious exception of regular night school classes and extension campus activities) gather a large number of persons for several sessions (either one condensed week or a series of evenings) at a low fee per participant. However, such education is usually a superficial review and does not provide in-depth education. The dilemma relates to the economics of aggregating a sufficient number of students. The number of students interested in the advanced subjects is small and the marketing effort on the part of the university of enrolling a sufficient number to "break even" is great.

## PLANS FOR THE FUTURE

Although the particular format of the non-resident program attempted in this project will not be pursued in its present form, the experience has given us substantial insight into the problems and opportunities in continuing education. Specifically, one suggestion has come out of our meeting with the representatives of the several state agencies. It was noted that, although there is some reluctance on the part of potential students to journey to the campus for orientation and introduction for one non-resident off-campus course, students often come for the more traditional one-week or longer short course (invariably without credit). For example, there is a waiting list for our 6-week professional program in urban transportation. A possible extension to such established programs is to provide the possibility, through self-study course modules, to continue in greater depth what was begun in the short course. Options could be provided, for example, depending on whether the student wishes to continue for credit or merely to further his or her knowledge. The extent of the "take home" portion of the work would depend upon whether credit is sought or not.

The advantage of this alternative is that, although relatively few participants might opt for the continuing studies, the recruiting effort on the part of the university is not great and would have been expended in the original organization of the short course in any event. In short, the marginal effort would be small compared to the benefit to interested participants who wish, for any number of reasons, to further their education.

With such an option, a natural bridge could be established between the pragmatic and more traditional short course and the more analytically oriented graduate type of education. Many of the goals originally set forth for our attempted non-resident program could be achieved (i.e., direct contact with the instructor and the institution to avoid the "correspondence school" stigma and a more complete and direct orientation of the participant into the course goals and format).

This option will be explored during the coming year when it is tentatively planned to offer two of the 6-week programs in urban transportation with introductory material in statistics, transportation planning and economics. Results will be provided to the National Science Foundation in the hope that such procedures will yet provide alternatives to the current need to foster continuing education as an integral part of a university's programs and responsibilities.

APPENDIX A

COURSE ANNOUNCEMENT



# Carnegie-Mellon University

## TRANSPORTATION RESEARCH INSTITUTE

announces

### NON-RESIDENT COURSES IN TRANSPORTATION beginning in August, 1975

The non-resident courses in Transportation are designed and structured to give the practicing professional the opportunity to keep abreast of developments in the field and to fill out gaps in his or her technical background. The courses are fully accredited by Carnegie-Mellon University and are equivalent to normal on-campus courses. On-campus sessions are held at the beginning and the end of each term with the remainder of the course presented via use of pre-prepared readings and exercises organized in modules. Contact is maintained between student and instructor via free telephone service.

#### STATISTICAL METHODS

The first offering, beginning in August 1975, is Statistical Methods (with emphasis on applications in transportation) and will be taught by George Duncan, Associate Professor at Carnegie-Mellon University (Department of Statistics). The course will be for 12 units with the tuition being \$475 (which includes the use of a hand calculator, all books, and complete lecture notes).

#### TRANSPORTATION INVESTMENT, PRICING, FINANCING AND PLANNING

The second offering will begin in February/March 1975, and will be taught by Martin Wohl, Professor of Transportation System Planning at Carnegie-Mellon University. This course will be for 9 units with the tuition being \$375.

For additional information and course description, write or call

James P. Romualdi, Director  
Transportation Research Institute  
Pittsburgh, Pennsylvania 15213  
(412) 621-2600 Extension 106

or return the following coupon:

Please send me additional information  
concerning the Non-Resident Courses in  
Transportation

Name \_\_\_\_\_

Address \_\_\_\_\_  
\_\_\_\_\_

**APPENDIX B**

**REFERENCES, INTERVIEWS AND CONTACTS**

## I. References for Course Development and Other Non-Resident Programs

### A. Correspondence

Ms. Kathy Feder, the University of Texas at Austin (or Group)  
regarding PSI courses in Statistics at University of Texas

Lionel V. Baldwin, Colorado State University (Dean, Engineering)  
regarding non-resident courses offered by Colorado State University

Bob Brown, University of Oklahoma (Director of Non-Resident)  
regarding non-resident programs at University of Oklahoma

Richard Wiegand, Georgia Institute of Technology (Director CEU)  
regarding non-resident programs at Georgia Tech

Shu-t'ien Li, World Open University, Inc. (President)  
regarding correspondence education in engineering

### B. Interviews

By phone - Ms. N. J. Galson, Syracuse University (Director)  
regarding non-resident programs at Syracuse University

Dr. Green, The Center for Personalized Instruction  
regarding PSI at the graduate level

Charles Goodspeed, Carnegie-Mellon University (Civil Engineer)  
regarding use of PSI

Mike Spring and Sam Deep, Pitt External Studies Program  
regarding Pitt's programs in non-resident education

Roland Smith, Carnegie-Mellon University (curriculum development)  
regarding curriculum and instructional development

Bell Telephone Company  
regarding the 800 line

### C. Books, Articles, etc.

MacKenzie, Christensen, Rigby, Correspondence Instruction in the  
United States, McGraw-Hill, 1968

MacKenzie and Christensen, The Changing World of Correspondence  
Study, PSU Press, 1971

Mager, Robert F., Preparing Objectives for Programmed Instruction

John H. Hess, Jr. "A Bibliography of Operant Instructional Technology  
in Higher Education", Eastern Mennonite College, Harrisonburg, Virginia  
1972 (xerox)

C. Books, Articles, etc. (continued)

Keller, Fred. S., "Good-bye, Teacher...", originally in Journal of Applied Behavior Analysis, No. 1, 1969

Keller and others in a collection on PSI and other derivatives of the Keller Plan by the University of Texas at Austin

D. Materials Received from Other Institutions

Massachusetts Institute of Technology - Self Study Program Materials

University of Pittsburgh - External Studies Program

Rensselaer Polytechnic Institute - Rensselaer/Hartford Graduate Programs

World Open University - Non-Resident Graduate Program

U. S. Department of Housing and Urban Development - University Without Walls Program

Syracuse University - University College

University of Oklahoma - Advanced Programs/Continuing Education and Public Service

Rutgers University - Open University Program

Colorado State University - SURGE Program

## II. References for Audio-Visual Techniques

Ralph Guggenheim - Carnegie-Mellon Public Relations Department (film)

Jack Smith - Carnegie-Mellon ITV (video tape)

Bill Ellis - Carnegie-Mellon (Post College Education Program)

Kevin Smith - Education Development Corporation, Newton, Massachusetts  
(Shapiro films)

Lydia Pratt - Pitt Communications Center (general media)

Bob Obrosky, Adele Patterson - Allegheny Intermediate Unit (media people  
for secondary schools in the area)

Phil and Tara Curry - Pittsburgh Film-makers Association

Barbara Miller - University of Pittsburgh, Admin. Sys. Group (tape user)

Dallas Clark - Television Production Corp. (TPC) (commercial video tapes)

Clark Rodgers - University of Pittsburgh, GSPIA (tape user)

Pauline Nist - Carnegie-Mellon University (Computation Center)

Matt Von Brautisch - WQED (Educational TV Station)

Various video tape and film dealers in the area, including Fotoshop (film),  
RPC (tape players), Motion Picture Film Service, WRS (film suppliers and  
processors, equipment rentals, etc.), Wolk's (film), Peerless-Willoughby  
(film), Dalto (equipment suppliers) and Dukane Corporation (suppliers)

APPENDIX C

SYLLABUS OF STATISTICS COURSE

## STATISTICAL METHODS

G. T. Duncan

One semester: 12 unit course

12 modules (+ 2 optional modules); each module can be completed in 2 weeks.

Emphasis on applications; background, 1 year calculus.

References G: Guttman, Wilks, and Hunter, Introductory Engineering Statistics, Wiley.

B: Brownlee, Statistical Theory and Methodology in Science and Engineering, Wiley.

### Module 1. Probability concepts: simple models

1. Usefulness of probabilistic reasoning
2. Frequency and subjective interpretations of probability
3. Probability rules motivated by the Venn diagram
4. Conditional probabilities and Bayes rule
5. Random variables and randomization

G: pp 1-30      B: pp 1-29

### Module 2. Collection and organization of data

1. Measurement and data collection
2. Surveys and survey design: randomization and stratification
3. Experimental designs: controls, randomized block, factorials
4. Data display: graphs, charts, and figures
5. Statistical summarization of data

G: pp 63-86

### Module 3. Random variables

1. The concept of a random variable
2. Working with Bernoulli and multi-Bernoulli random variables
3. Continuous random variables: normal and beta
4. Expected values and variance
5. Sums of random variables
6. Associated random variables: dependence and correlation

G: pp 87-93; 96-110      B: pp 24-60

### Module 4. Statistical inference about parameters

1. Describing uncertainty with a probability density function
2. How uncertainties change with data: moving from a prior distribution to a posterior distribution
3. Point and interval estimation. Bayes and maximum likelihood

G: pp 191-231; 165-169; 177-181      B: pp 87-96; 121-129

### Module 5. Hypothesis testing.

1. Basic concepts
2. Tests concerning the mean of a normal distribution

G: 237-247      B: pp 97-120; 130-132

### Module 6. Statistical inference about models

1. Model within a model
2. Tests of randomness
3. Goodness of fit: likelihood ratio, chi-square, and posterior odds

G: pp 293-297      B: pp 206-207; 221-235

### Module 7. Probability models: application and estimation

1. Further models for counts: geometric, hypergeometric, Poisson, negative binomial distributions
2. Models for measurements: beta, normal, exponential, gamma, Weibull
3. Queueing models

G: pp 31-45; 139-145      B: pp 158-162; 166-173; 190-203

Module 8. Binary comparison of means

1. Basic approaches
2. Comparison of two normal means
3. Comparison of two binomial probabilities
4. Comparison of two multinomial probability vectors
5. Comparison of two Poisson means
6. Comparison of two nonnormal measurement means

G: pp 170-174; 248-251      B: pp 119; 150; 181-185

Module 9. Association of variables based on counts: contingency tables

1. Measuring association
2. Checking for independence

G: pp 298-307      B: pp 211-216

Module 10. Multiple comparison of means: one-way analysis of variance

1. Normal means
2. Means of counts: binomial, Poisson, other
3. Nonnormal measurement means

G: pp 371-376      B: pp 309-330

Module 11. Simple linear regression and correlation

1. Normal model
2. Bayes and least squares estimation
3. Correlation

G: pp 339-357      B: pp 334-375; 397-414

Module 12: Multiple linear regression

1. Polynomial models
2. Examination of residuals
3. Several independent variables

G: pp 358-363      B: pp 419-454

Module 13 (optional). Analysis of factorial and response surface experimental designs

1. Factorial designs
2. Response surfaces

G: pp 403-464

Module 14 (optional). Nonparametric tests

1. Sign test
2. Wilcoxon two-sample rank test
3. Kruskal-Wallis H test

B: pp 241-2; 251-257

APPENDIX D

QUESTIONNAIRE AND SUMMARY OF RESPONSES

# CONTINUING EDUCATION QUESTIONNAIRE

INSTRUCTIONS: Please answer the following questions and return the questionnaire to:

1. Do you think additional education is necessary (or useful) for advancement beyond your current position? (Check the appropriate answer.)  
 (77) no (88) probably not (465) probably useful (407) yes, definitely
2. The following are often given as reasons for pursuing additional education. Please give your personal viewpoint on each. (Circle the appropriate number.)
  - a) personal achievement (regardless of economic gain)
 

|          |     |     |      |      |       |       |       |       |           |
|----------|-----|-----|------|------|-------|-------|-------|-------|-----------|
| disagree | 1   | 2   | 3    | 4    | 5     | 6     | 7     | agree | mean=5.66 |
|          | (0) | (0) | (21) | (63) | (280) | (315) | (336) |       | S.D.=1.35 |
  - b) increases likelihood of immediate advancement
 

|          |      |      |      |       |       |       |       |       |           |
|----------|------|------|------|-------|-------|-------|-------|-------|-----------|
| disagree | 1    | 2    | 3    | 4     | 5     | 6     | 7     | agree | mean=4.50 |
|          | (98) | (49) | (63) | (224) | (308) | (175) | (112) |       | S.D.=1.70 |
  - c) increases long term likelihood of advancement
 

|          |     |     |     |      |       |       |       |       |           |
|----------|-----|-----|-----|------|-------|-------|-------|-------|-----------|
| disagree | 1   | 2   | 3   | 4    | 5     | 6     | 7     | agree | mean=5.76 |
|          | (0) | (0) | (0) | (56) | (240) | (336) | (360) |       | S.D.=1.3  |
  - d) provides additional mobility for job changes
 

|          |     |     |     |      |       |       |       |       |           |
|----------|-----|-----|-----|------|-------|-------|-------|-------|-----------|
| disagree | 1   | 2   | 3   | 4    | 5     | 6     | 7     | agree | mean=5.72 |
|          | (0) | (0) | (0) | (88) | (232) | (352) | (336) |       | S.D.=1.27 |
  - e) enables one to stay abreast of new developments in a particular field
 

|          |     |     |     |      |       |       |       |       |           |
|----------|-----|-----|-----|------|-------|-------|-------|-------|-----------|
| disagree | 1   | 2   | 3   | 4    | 5     | 6     | 7     | agree | mean=6.00 |
|          | (0) | (0) | (0) | (40) | (210) | (300) | (460) |       | S.D.=1.17 |
  - f) enables one to do a better job
 

|          |     |     |     |      |       |       |       |       |           |
|----------|-----|-----|-----|------|-------|-------|-------|-------|-----------|
| disagree | 1   | 2   | 3   | 4    | 5     | 6     | 7     | agree | mean=5.70 |
|          | (0) | (0) | (0) | (96) | (272) | (280) | (360) |       | S.D.=1.31 |
  - g) other (specify)

# CONTINUING EDUCATION QUESTIONNAIRE

- 2 -

3. Are you interested in continuing education in any form? 120 no 940 yes  
If yes, answer the rest of this question. If no, go to Question 4.

Please indicate how you feel towards the following educational formats.

- a) Workshops and seminars (1/2 to 2 day duration)

|                |      |     |      |      |       |       |       |                 |           |
|----------------|------|-----|------|------|-------|-------|-------|-----------------|-----------|
| not interested | 1    | 2   | 3    | 4    | 5     | 6     | 7     | very interested | mean=5.71 |
|                | (21) | (0) | (21) | (56) | (217) | (280) | (343) |                 | S.D.=1.39 |

- b) Short courses (one week or less in duration)

|                |      |     |     |      |       |       |       |                 |           |
|----------------|------|-----|-----|------|-------|-------|-------|-----------------|-----------|
| not interested | 1    | 2   | 3   | 4    | 5     | 6     | 7     | very interested | mean=5.63 |
|                | (28) | (0) | (0) | (63) | (224) | (329) | (280) |                 | S.D.=1.39 |

- c) Mini-semesters (approximately 4-6 weeks of concentrated work - no credit)

|                |       |      |      |       |       |       |      |                 |           |
|----------------|-------|------|------|-------|-------|-------|------|-----------------|-----------|
| not interested | 1     | 2    | 3    | 4     | 5     | 6     | 7    | very interested | mean=4.00 |
|                | (160) | (85) | (95) | (170) | (210) | (150) | (80) |                 | S.D.=1.89 |

- d) Standard university format except for no college credit

|                |       |      |      |       |       |      |      |                 |           |
|----------------|-------|------|------|-------|-------|------|------|-----------------|-----------|
| not interested | 1     | 2    | 3    | 4     | 5     | 6    | 7    | very interested | mean=3.55 |
|                | (240) | (90) | (80) | (185) | (210) | (95) | (45) |                 | S.D.=1.90 |

- e) Standard university format for college credit

|                |      |      |      |       |       |       |       |                 |           |
|----------------|------|------|------|-------|-------|-------|-------|-----------------|-----------|
| not interested | 1    | 2    | 3    | 4     | 5     | 6     | 7     | very interested | mean=5.07 |
|                | (96) | (30) | (30) | (138) | (156) | (210) | (288) |                 | S.D.=1.91 |

- f) Courses as an explicit part of a degree program

|                |       |      |      |       |       |       |       |                 |           |
|----------------|-------|------|------|-------|-------|-------|-------|-----------------|-----------|
| not interested | 1     | 2    | 3    | 4     | 5     | 6     | 7     | very interested | mean=5.00 |
|                | (102) | (36) | (30) | (150) | (162) | (180) | (282) |                 | S.D.=1.95 |

- g) Home study courses - no college credit

|                |       |      |      |       |       |      |      |                 |           |
|----------------|-------|------|------|-------|-------|------|------|-----------------|-----------|
| not interested | 1     | 2    | 3    | 4     | 5     | 6    | 7    | very interested | mean=3.66 |
|                | (235) | (70) | (85) | (185) | (235) | (95) | (55) |                 | S.D.=1.91 |

- h) Home study courses - with college credit

|                |       |      |      |       |       |       |       |                 |           |
|----------------|-------|------|------|-------|-------|-------|-------|-----------------|-----------|
| not interested | 1     | 2    | 3    | 4     | 5     | 6     | 7     | very interested | mean=4.69 |
|                | (130) | (35) | (55) | (145) | (185) | (190) | (210) |                 | S.D.=1.98 |

4. Another format that could be utilized is termed self-paced. In general, students would come to the university at the beginning and end of a term for meetings with the instructor(s) of a particular course to discuss the course material; the bulk of the material to be examined, however, would be done by the student at home and with no direct supervision. Assignments would be turned in and corrected and the instructor(s) would be available (via free telephone) for consultation. The student would have the flexibility to schedule his or her study time around job requirements and so forth.

# CONTINUING EDUCATION QUESTIONNAIRE

- 3 -

a) What is your opinion of this kind of format?

not interesting 1 2 3 4 5 6 7 very interesting mean=4.75  
(135)(60) (60)(120)(210)(225)(245) S.D.=2.00

b) Would you prefer the courses to be degree terminal or not?

(350)degree terminal (672) not necessarily degree terminal (optional)  
(56)definitely not degree terminal

5. How many hours per week do you (or could you) spend at this time on continuing education, assuming that you did not have to attend regularly scheduled classes? (Circle the appropriate number.)

none one-three four-s'x seven-nine more than nine  
(117) (261) (432) (198) (54)

6. Do you expect your circumstances to change so that you would be willing to spend more time on continuing education?

(473)no (110) yes (485) don't know  
if yes, how many hours per week do you anticipate being able to sprnd?

7. What areas would be of interest to you in furthering your education (such that you would be willing to make the above commitment to it)? (Circle the appropriate ones.)

|                                               | no<br>interest |           |           | great<br>interest |            |            | Do you have<br>formal training<br>in this area? |                 |
|-----------------------------------------------|----------------|-----------|-----------|-------------------|------------|------------|-------------------------------------------------|-----------------|
| Basic calculus<br>(mean=2.86)                 | 1<br>(396)     | 2<br>(45) | 3<br>(36) | 4<br>(153)        | 5<br>(108) | 6<br>(45)  | 7<br>(36)                                       | (833)Yes(238)No |
| Basic economics<br>(mean=4.25)                | 1<br>(170)     | 2<br>(40) | 3<br>(30) | 4<br>(145)        | 5<br>(210) | 6<br>(175) | 7<br>(95)                                       | (799)Yes(272)No |
| Statistics<br>(mean=4.4)                      | 1<br>(155)     | 2<br>(25) | 3<br>(40) | 4<br>(145)        | 5<br>(215) | 6<br>(175) | 7<br>(120)                                      | (624)Yes(455)No |
| Construction methods<br>(mean=5.23)           | 1<br>(72)      | 2<br>(18) | 3<br>(30) | 4<br>(96)         | 5<br>(192) | 6<br>(234) | 7<br>(258)                                      | (611)Yes(481)No |
| Pavement design<br>(mean=4.48)                | 1<br>(135)     | 2<br>(40) | 3<br>(45) | 4<br>(150)        | 5<br>(215) | 6<br>(165) | 7<br>(140)                                      | (598)Yes(481)No |
| Highway planning<br>and design<br>(mean=5.13) | 1<br>(165)     | 2<br>(0)  | 3<br>(30) | 4<br>(115)        | 5<br>(210) | 6<br>(210) | 7<br>(240)                                      | (644)Yes(420)No |
| Cost benefit<br>analysis<br>(mean=4.87)       | 1<br>(90)      | 2<br>(20) | 3<br>(35) | 4<br>(150)        | 5<br>(215) | 6<br>(230) | 7<br>(160)                                      | (504)Yes(576)No |

# CONTINUING EDUCATION QUESTIONNAIRE

- 4 -

|                                               | <u>no<br/>interest</u> |      |      |       |       | <u>great<br/>interest</u> |       | <u>Do you have<br/>formal training<br/>in this area?</u> |
|-----------------------------------------------|------------------------|------|------|-------|-------|---------------------------|-------|----------------------------------------------------------|
|                                               | 1                      | 2    | 3    | 4     | 5     | 6                         | 7     | <u>(320)Yes(752)No</u>                                   |
| Travel demand<br>forecasting<br>(mean=4.26)   | (140)                  | (50) | (45) | (200) | (200) | (160)                     | (90)  |                                                          |
| Urban planning<br>principles<br>(mean=4.59)   | 1                      | 2    | 3    | 4     | 5     | 6                         | 7     | <u>(336)Yes(736)No</u>                                   |
|                                               | (115)                  | (30) | (40) | (175) | (210) | (175)                     | (145) |                                                          |
| Management techniques<br>(mean=5.76)          | 1                      | 2    | 3    | 4     | 5     | 6                         | 7     | <u>(528)Yes(552)No</u>                                   |
|                                               | (32)                   | (0)  | (0)  | (64)  | (152) | (288)                     | (384) |                                                          |
| Traffic flow theory<br>(mean=4.39)            | 1                      | 2    | 3    | 4     | 5     | 6                         | 7     | <u>(360)Yes(720)No</u>                                   |
|                                               | (110)                  | (50) | (55) | (180) | (220) | (175)                     | (95)  |                                                          |
| Transportation economics<br>(mean=4.95)       | 1                      | 2    | 3    | 4     | 5     | 6                         | 7     | <u>(360)Yes(720)No</u>                                   |
|                                               | (80)                   | (25) | (30) | (135) | (230) | (225)                     | (175) |                                                          |
| Transportation models<br>(mean=4.19)          | 1                      | 2    | 3    | 4     | 5     | 6                         | 7     | <u>(288)Yes(789)No</u>                                   |
|                                               | (135)                  | (45) | (65) | (225) | (195) | (135)                     | (90)  |                                                          |
| Energy requirements<br>(mean=4.69)            | 1                      | 2    | 3    | 4     | 5     | 6                         | 7     | <u>(234)Yes(846)No</u>                                   |
|                                               | (100)                  | (30) | (50) | (165) | (205) | (200)                     | (145) |                                                          |
| Politics of trans-<br>portation<br>(mean=4.6) | 1                      | 2    | 3    | 4     | 5     | 6                         | 7     | <u>(234)Yes(846)No</u>                                   |
|                                               | (140)                  | (32) | (32) | (164) | (192) | (176)                     | (184) |                                                          |
| Other (specify)                               |                        |      |      |       |       |                           |       |                                                          |

We have been discussing two series of courses with specific emphases in transportation. One series would deal with transportation system administration, management and operation. While areas of investment planning, system planning and so forth would be covered in this series, the courses would all be geared toward the Administration/Management side.

8. Please indicate your level of interest in this type of course.

| <u>no interest</u> |     |  | <u>great interest</u> |      |       |       |       |           |
|--------------------|-----|--|-----------------------|------|-------|-------|-------|-----------|
| 1                  | 2   |  | 3                     | 4    | 5     | 6     | 7     | mean=5.45 |
| (56)               | (0) |  | (0)                   | (80) | (192) | (312) | (352) | S.D.=1.64 |

The other emphasis would be on the exploration of maintenance issues. With the near completion of the interstate program and other transportation facilities, the attention of technical and managerial personnel will be focusing on the continuing operation and upkeep of these facilities. There are a significant

# CONTINUING EDUCATION QUESTIONNAIRE

- 5 -

number of methodologies that can be brought to bear on maintenance problems. They involve the allocation and reallocation of natural, material and human resources.

9. Please indicate your level of interest in this type of course.

|           | <u>no interest</u> |      |      |      | <u>great interest</u> |       |       |
|-----------|--------------------|------|------|------|-----------------------|-------|-------|
| mean=5.45 | 1                  | 2    | 3    | 4    | 5                     | 6     | 7     |
| S.D.=1.64 | (21)               | (56) | (42) | (98) | (203)                 | (301) | (329) |

10. In what city and state are you located? \_\_\_\_\_

11. What is the nearest university offering courses useful to you?

\_\_\_\_\_ What kind of courses? \_\_\_\_\_

12. How far away is the university named in question 11?

time (mean = 4 hrs) \_\_\_\_\_ distance (mean = 33.7 miles) \_\_\_\_\_

13. Have you previously participated in any continuing education programs (including standard college courses)?

Please describe the format and subject area(s).

14. Are you now participating in a continuing education program?

(140)Yes (940)No

Please describe the format and subject area(s).

15. What is the extent of your education (check all appropriate)?

( 99) High School

(162) Some college or university work (no degree)

(441) Bachelor's Degree Area: \_\_\_\_\_

( 81) Additional undergraduate work Area: \_\_\_\_\_

(135) Graduate degree (Master's) Area: \_\_\_\_\_

( 63) Additional graduate work beyond Master's (no Ph.D.) Area: \_\_\_\_\_

( 18) Ph.D Area: \_\_\_\_\_

\_\_\_\_\_ Other (specify degree and area or the program) \_\_\_\_\_

# CONTINUING EDUCATION QUESTIONNAIRE

- 6 -

16. How many years has it been since your last educational experience? (mean=7.0)  
Specify \_\_\_\_\_  
How many years has it been since your last degree? (mean=12.4)

17. If you are not now participating in a continuing education program, please indicate the appropriateness of the following reasons:

- a) I have no desire to participate in any continuing education program.

|                   |       |       |       |       |      |      |      |                |
|-------------------|-------|-------|-------|-------|------|------|------|----------------|
| strongly disagree | 1     | 2     | 3     | 4     | 5    | 6    | 7    | strongly agree |
|                   | (384) | (160) | (128) | (112) | (72) | (32) | (24) | (mean=2.6)     |

- b) No continuing education program, of any sort, is available.

|                   |       |       |       |       |      |      |      |                |
|-------------------|-------|-------|-------|-------|------|------|------|----------------|
| strongly disagree | 1     | 2     | 3     | 4     | 5    | 6    | 7    | strongly agree |
|                   | (252) | (114) | (108) | (216) | (72) | (54) | (78) | (mean=3.27)    |

- c) No continuing education program of any interest to me is available.

|                   |       |       |       |       |       |       |       |                |
|-------------------|-------|-------|-------|-------|-------|-------|-------|----------------|
| strongly disagree | 1     | 2     | 3     | 4     | 5     | 6     | 7     | strongly agree |
|                   | (184) | (100) | (100) | (196) | (112) | (104) | (120) | (mean=3.82)    |

- d) Programs are available, but the time requirements are too great.

|                   |       |      |      |       |       |       |      |                |
|-------------------|-------|------|------|-------|-------|-------|------|----------------|
| strongly disagree | 1     | 2    | 3    | 4     | 5     | 6     | 7    | strongly agree |
|                   | (100) | (72) | (84) | (246) | (144) | (150) | (90) | (mean=4.19)    |

- e) Programs are available, but the cost is too great.

|                   |       |      |      |       |       |       |       |                |
|-------------------|-------|------|------|-------|-------|-------|-------|----------------|
| strongly disagree | 1     | 2    | 3    | 4     | 5     | 6     | 7     | strongly agree |
|                   | (102) | (48) | (54) | (264) | (114) | (150) | (156) | (mean=4.44)    |

- f) Programs are available; if I could get time off from work I would participate.

|                   |      |      |      |       |       |       |       |                |
|-------------------|------|------|------|-------|-------|-------|-------|----------------|
| strongly disagree | 1    | 2    | 3    | 4     | 5     | 6     | 7     | strongly agree |
|                   | (84) | (54) | (48) | (264) | (144) | (120) | (180) | (mean=4.53)    |

- g) Programs are available, but in the wrong area.

|                   |      |      |      |       |       |       |       |                |
|-------------------|------|------|------|-------|-------|-------|-------|----------------|
| strongly disagree | 1    | 2    | 3    | 4     | 5     | 6     | 7     | strongly agree |
|                   | (66) | (30) | (36) | (216) | (132) | (156) | (258) | (mean=3.78)    |

- h) Other (Specify)

18. Your age (mean = 38.36)

Marital Status (Circle one)      Single      Married

Job Classification

Position Title \_\_\_\_\_

Grade \_\_\_\_\_